Sleep and Academic Performance: What students and faculty need to know.

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Abstract

During the past few decades much progress has been made in our understanding of the function of sleep and its importance to academic performance. It is now clear that both the quantity and quality of sleep has a direct and significant effect on human memory function and on the health of the nervous system. Included are general recommendations to raise the quality of sleep.

Key words : sleep, sleep hygiene, sleep debt, circadian rhythms

The importance of sleep

For the majority of people the word "sleep" is conceptually associated with "rest." Sleep for many people, is just a long rest during the night. But sleep is not rest. During sleep the brain is active, as are the immune and hormonal systems and other systems throughout the body. Every animal requires sleep, or they will die. The past five decades of research into sleep have shown that the quality and amount of sleep we get is of critical importance to our physical health, our capacity to learn, our thinking, our mental health, our personal safety and how long we will live.1)

As teachers, we want to do everything we can to enhance the academic performance of our students. Research studies indicate that sleep plays an important role in consolidation of memory and learning. While there may questions regarding aspects of sleep, we now have sufficient knowledge to recommend general advice as to how students can develop more effective sleep habits, which in turn should have a positive effect on their academic performance and life habits. The following literature review and recommendations are meant to communicate the importance of sleep for academic performance and for other aspects of the student's life. In this review academic performance refers not only to course grades and test scores, but also to long term recall of information.

Sleep and memory consolidation

Human memory is divided into three categories of memory: procedural memory, declarative memory, and working memory. Briefly, procedural memory is generally related to sensory experience and sequential patterns of events or actions. Declarative memory is the type of memory emphasized in academic settings. Declarative memories can be recalled through conscious recollection of the abstract knowledge. Both procedural and declarative knowledge are relatively permanent forms of memory. In contrast, working memory functions as a temporary store for information that is being worked on [1,2,3].

Early research investigated the role of sleep with each of these forms of memory, initially using sleep deprivation; that is, preventing participants from falling asleep. In a sleep deprivation study two groups of participants are exposed to the same learning task, under the same

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conditions. One group is allowed to sleep, while the other group is prevented from sleeping. An early study by Jenkins and Dallenbach found that participants who slept after a learning task remembered more than participants who did not sleep following learning [4,5]. A number of more recent experiments have confirmed and extended these findings. Together, these and similar studies indicated that sleep leads to consolidation of learned material in declarative memory, whereas a lack of sleep leads to reduced memory for learned items. More precisely, sleep is thought to act on the consolidation of memories through reactivation of initial memories in hippocampus and associated organs during sleep. The consolidation process is thought to transfer memories to the neocortical networks where they are preserved as long-term memories. [6,7].

One criticism of early studies using sleep deprivation paradigms is that participants in the sleep deprivation groups experienced greater fatigue and/or differing time of day effects (circadian effects). That is, fatigue being greater for the non-sleeping group could explain why their recall was inferior to the sleeping group. However, there are two kinds of evidence which overcome this criticism. The first evidence comes from animal studies of sleep deprivation and learning, nearly all of it supporting the findings in human research studies. A second confirmation comes from a study by Gais, Lucus and Born, in which they carefully controlled for time of day and fatigue between experimental groups. Their study found that sleep following within a few hours of exposure resulted in enhanced learning over a group which did not sleep.[8]

An interesting variation using sleep deprivation was conducted by Yoo and associates. Previous studies had focused on the need for sleep after learning, but Yoo and his associates focused on the need for sleep before learning. One group was deprived of sleep the evening before the learning task, while the other group simply slept as usual. The task involved viewing a series of picture slides. All participants returned two days later for a recognition test. They found that the sleep deprived group performed significantly worse than those who got sleep. They concluded that encoding during the learning phase was impaired in the sleep deprived group. Thus, poor sleep can impair students at both learning (encoding) and at recall (consolidation) [9].

Better Grades

In a 2006 study by Italian researchers found direct evidence that sleep quality and the amount of sleep were predictive of learning performance. [10] Another major study found that sleep habits of first year university students were highly correlated with academic performance . [11]

Sleep Cleans the Brain

A recently discovered function of sleep is that during sleep processes take place in the brain that cleans it. During sleep the brain fluid flows increase and wash away metabolite, which are the toxins and waste that the brain produces everyday of our lives. This cleaning function clears away toxins that are known to contribute to Alzheimer' s disease and other disorders of the nervous system. [12]

An alarming trend

There is an alarming trend: people in developed countries throughout the world are getting less sleep. Average sleep time has decreased by 20 % during the past century. [13] The decrease in sleep is not only among adults, but among all age groups, including children. Japan currently is the country with the least sleep on workdays. According to the International Bedroom Poll, the average adult in Japan averages only six hours and 22 minutes of sleep per night. The United States came in second, with an average sleep of only six hours and 31 minutes. In general, people have reduced their sleep times by 20 percent during the past century. Another alarming finding was that university students currently average two hours less per night than they did in the 1980s.

According to the Center for disease Control in the U.S.,

getting less than 8 hours of sleep results in a number of negative personal and health related effects: including mood problems, increased frequency of illness, lack of energy, decrease in emotional control, a decrease in concentration and greater difficulty remembering new information. There concerns that as the level of sleep drops, there may be an increase in accidents.

What can the student do to get better sleep?

There are several simple but effective ways to improve your sleep. One of the most effective ways to get better sleep is to go to bed and wake up on a regular schedule. That is the lesson from circadian rhythms: regulating behavior to a regular timing. As you go to sleep at the same time each day your body will respond to the regular timing and you may find that you fall asleep more easily. As you keep the same wake up time your body will adjust and you will wake up more easily and more refreshed. Try to eat your evening meal two or more hours before going to bed.

If you can create a habit of relaxing prior to going to bed, you may find that you get better sleep. You might dim the lights and listen to soothing music for half an hour to an hour each night. Dimming the light an hour or more before going to sleep is highly recommended. Bright light is stimulating and con make it more difficult to sleep, so avoid television and electronic devises an hour or more before going to bed.

Some people like to exercise before going to bed, but sleep experts advise exercising during the day time, or at least several hours before bedtime. Exercise or other stimulating activities tend to raise the body temperature which sends the wrong signal to your body. You want a slightly cooler body for effective sleep. When your body temperature cools down the nervous system prepares to sleep. So it may be a good idea to keep your bead room a little cooler.

Avoid drinking coffee and alcohol in the evening, and particularly the hours before sleeping. Many people think that alcohol helps them sleep, but the truth is that alcohol interferes with sleep.

References:

1) Chivers, T. 2014. How much do we know about sleep? : an interview with Russel Foster. Available: www.telegraph.co.uk/science/10494965
2) Gazzaniga M, Ivry J, Mangun G: Cognitive Neuroscience: 2008. The Biology of Mind MIT Press, Cambridge, (4th Edition).
3) Baddeley A: Working memory: looking back and looking forward. Nat Rev Neurosci. :4(10):829-39. 2003.
4) Mu Q, Nahas Z etal: Decreased cortical response to verbal working memory following sleep deprivation. Sleep 2005: 28 55-67.
5) Jenkins J Dallenbach K 1924: Olivescence during sleep and waking. Amer.Jour of Psychology 35: 605-612.
6) Gais S & Born J 2014：Declarative memory consolidation: mechanisms acting during human sleep. Sleep & Memory 11: 679-685.
7) Payne D Nadel L 2014: Sleep, dreams, and memory consolidation: The role of the stress hormone cortisol Learn. Mem. 2004. 11: 671-678
8) Gais S Lucus B & Born J 2006：Sleep after learning aids recall. Learn. Mem. 2006. 13: 259-262.
9) Yoo S Hu P et al 2007：A deficit in the ability to form new human memories without sleep. Nat. Neuroscience 10, 3, 385-392.
10) Curcio G Ferrara M & Gennaro L :2006 Sleep loss, learning capacity and academic performance. Sleep Medicine Reviews, 10, 323-337.
11) Trockel M Barnes M & Egget D：2000 Health-Related Variables and Academic Performance Among First-Year College Students: Implications for Sleep and Other Behaviors. Journal of American College Health. 49, 3, 125-131.
12) Yang L Kress B et al 2013: Evaluating glymphatic function utilizing clinically relevant intrathecal infusion of CFS tracer.
13) (Ferrara & Gennaro 2001; Sarah Takushi 2014, available: Journal of Trans Med.
Available: http://guardianlv.com/2014/07/sleep-deprivation-around-the-world/)

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睡眠とアカデミック・パフォーマンス：学生と教員に求められる知見

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要　旨

ここ数 10 年の間における研究をとおして，アカデミック・パフォーマンスにおける睡眠の役割と重要性への理解が進んできた。睡眠の量および質という両側面が，人間の記憶機能と神経系の働きに直接的かつ重大な影響を持つことが明らかになってきている。本稿では，最近の研究文献を多角的かつ複合的に再考し，アカデミック・パフォーマンスを向上させるためには睡眠の質を高めることが重要かつ不可欠であるという提言を試みる。

キーワード：睡眠　睡眠衛生　睡眠不足　概日リズム